PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements in or relating to Hearing Aids

I, ERICH SCHUMANN, a German citizen, of Platenstrasse 3, Hamburg-Hochkamp, Germany, do hereby declare the invention for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

In a type of hearing aid which has been commonly used in the past, a microphone has generally been assembled into a unit with an amplifying apparatus and the unit has been connected by wires or cords to a receiver placed in the auditory canal, if air conduction is to be used, or on the mastoid process behind the ear shell if bone conduction is to be used.

Hearing aids of this kind have been unsatisfactory in that it has not been possible to conceal them more than partially from sight. Adapting the colour of the connecting cords to that of the skin, for example, makes the wearing of a hearing aid less conspicuous but the fact that one is being worn remains quite apparent.

It is an object of the present invention to provide a hearing aid which can be used in such a way that the fact that a hearing aid is being used is largely or completely disguised.

According to the invention a hearing aid comprises a receiver and means for operating the receiver, the receiver and part of the means, including an antenna, being embodied in a spectacle frame provided with plain or optically-correcting lenses whilst the remainder of the means, comprising a microphone and means for transmitting to the antenna signals generated by sound waves falling on the microphone, is physically separate from the spectacle frame.

The part that is physically separate from the spectacle frame may be carried in a handbag, a brief case, a cigarette case or coat pocket, for instance.

The components of the means which are embodied in the spectacle frame may be so embodied by being completely embedded in the various parts of the frame, such as the side arms, lens rims or the nose bridge and the components may in themselves form such parts. They may also be provided in the form of ornamental parts of the frame.

The components which are embodied in the spectacle frame can now be obtained in such small sizes that they can be embodied in frames which in appearance differ little if at all from those in common use by persons whose hearing is not affected. Since the use of hearing aids is less common than the use of spectacles many people whose hearing is impaired would prefer to wear spectacles incorporating a hearing aid and having plain lenses than to wear a hearing aid which is not disguised and therefore immediately advertises their affliction. The spectacle frames may be provided with normal spectacle lenses whereby defects of vision are corrected, but if the vision of the user is normal the lenses should be plain instead of curved.

The spectacle frame may be a "pre-frame" i.e. an additional frame adapted to be worn with or carried on an ordinary pair of spectacles and which appear at least to perform some ordinary optical function. Such a pre-frame may carry sun-glass lenses or some other additional lenses.

The antenna embodied in the spectacle frame may be, for instance, a dipole antenna tuned to receive high frequency electromagnetic oscillations generated by the transmitting means. The components in the spectacle frame may be only the antenna and a rectifier connected to the receiver and the separate unit may contain a microphone, a control amplier and a miniature high frequency transmitting valve.

Such an arrangement offers the advantage that the acoustic properties of the sound, e.g. its intensity and timbre may be improved since a larger microphone e.g. a condenser microphone, of better quality and sensitivity than any small enough to be incorporated in the spectacle frames themselves can be used if the microphone forms part of a separate unit.

Moreover, the sound waves with such an arrangement, in contrast to those associated

with the hearing aids used so far, suffer no distortions and may be transmitted via a high quality transmitter valve and radiated as modulated high frequency vibrations. The rectifier between the antenna on the receiver may be a diode, a siruter i.e. a rectifier of the copper oxide type or a germanium crystal. Germanium transistor elements may also be used as amplifiers.

The receiver may be either a bone or air conduction receiver. If the receiver is of the air conduction type it is necessary to provide a conduit for conveying the vibrations produced by the receiver from the receiver to the auditory canal of the ear. The spectacles and the position of the receiver may be arranged so that the conduit need only be short and it may pass either around the pinna or through a perforation in the pinna. Only a minor surgical operation is necessary to make this perforation. The conduit may be made from plastic material. The connection between the end of the conduit and the spectacle frame may be by means of a plug and socket connector. The other end of the conduit is adapted to fit into the auditory canal of the ear. The cross-section of the conduit may increase gradually from the end which is connected to the spectacle frame to the end which is adapted to fit into the auditory canal.

If the spectacle frames are of the sort which have side arms, a receiver may, if the hearing of both ears is impaired, be incorporated in each arm to provide amplification for both ears. The frame will thus be provided with two air-conduction receivers or two bone-conduction receivers, as the case may be.

If the hearing aid makes use of bone conduction, the receiver may be situated to operate on the mastoid process, for instance, or on the nasal bone, the temporal bone or the frontal bone above the eye-pits.

A hearing aid according to the invention may be used not only completely individually, but at public gatherings, in theatres, cinemas and lecture rooms for instance. In such circumstances a common transmitter unit may be arranged near the stage or the orator's stand and an appropriate spectacle frame tuned to the transmitter, worn by any member of the audience who desires to have the sound which he receives amplified. A similar arrangement might be used in theatrical productions, the spectacle frame being worn by an actor and the transmitter arranged in the prompter's box. It would also be useful at police or fire brigade actions and at sports meetings. The arrangement has the advantage that the amplification is individual so that persons not wearing the spectacles are not troubled or affected by the transmitted signals.

By way of example an embodiment of the invention will now be described with reference to the accompanying drawing, in which:—

Fig. 1 shows a perspective view of a spectacle frame embodying the receiver; and

Fig. 2 shows diagrammatically the components of the means for operating the receiver which are physically separate from the spectacle frame.

In Fig. 1 a receiving antenna 1 is situated in one of the side arms of the spectacle frame. The antenna 1 is connected to a rectifier 2 which rectifies the modulated high frequency of the antenna 1 and a bone conduction receiver 3 mounted in the end of the side arm for co-operation with the mastoid process.

In Fig. 2 the components for the means for operating the receiver 3 which are separate from the spectacle frame i.e. the components for transmitting signals to the aerial in the spectacle frame which are tuned to receive them are arranged in a bag 4. They include apertures 5 and 6 situated in the bottom of the bag 4 and a microphone 7, a control amplifier 8 and a high frequency valve 9 provided with a radiation antenna 10.

What I claim is:—

1. A hearing aid comprising a receiver and means for operating the receiver, the receiver and part of the means, including an antenna, being embodied in a spectacle frame provided with plain or optically correcting lenses whilst the remainder of the means, comprising a microphone and means for transmitting to the antenna signals generated by sound waves falling on the microphone, is physically separate from the spectacle frame.

2. A hearing aid as claimed in claim 1 in which the antenna is tuned to the transmitting frequency of the transmitting means.

3. A hearing aid as claimed in either of the preceding claims in which the antenna is a dipole antenna.

4. A hearing aid as claimed in any of the preceding claims in which the part of the means for operating the receiver which is embodied in the spectacle frame includes a germanium crystal connected between the receiver and the antenna to act as a rectifier.

5. A hearing aid as claimed in any of the preceding claims in which the means for operating the receiver comprises a germanium transistor acting as an amplifier.

6. A hearing aid as claimed in any of the preceding claims in which the part of the means for operating the receiver that is physically separate from the spectacle frame is embodied in a handbag, a cigarette case or a brief case.

7. A hearing aid as claimed in any of the preceding claims in which the receiver is one of two or more, each of which is embodied in a separate spectacle frame and the part of the means for operating the receiver that is physically separate is common to both or all the receivers.

8. A hearing aid as claimed in any of the

preceding claims in which the microphone is a condenser microphone.

9. A hearing aid as claimed in any of the preceding claims in which the receiver is of the bone conduction type.

10. A hearing aid as claimed in claim 9 in which the spectacle frame is of the type having side arms and the receiver is mounted in the free end of one of the side arms of the spectacle frame to co-operate with the mastoid process.

11. A hearing aid as claimed in claim 10 comprising a further receiver of the bone conduction type mounted in the free end of the other side arm of the spectacle frame to co-operate with the other mastoid process.

12. A hearing aid as claimed in claim 11 in which the receiver is arranged to co-operate with the nasal bone, the temporal bone or the frontal bone above the eye-pits.

13. A hearing aid as claimed in any of claims 1 to 8 in which the spectacle frame is of the type having side arms and the receiver is of the air conduction type, the receiver being embodied in the end of one of the side arms and provided with a conduit, of which the free end is adapted to fit into an ear, for conveying vibrations generated by the receiver into the auditory canal of the ear.

14. A hearing aid as claimed in claim 13 in which a further receiver of the air conduction type, similarly provided with a conduit, is embodied in the end of the other side arm.

15. A hearing aid as claimed in either of claims 13 or 14 in which the cross section of the, or each conduit increases in the direction of the end that is adapted to fit into the ear.

16. A hearing aid as claimed in any of the preceding claims in which the spectacle frame is a pre-frame adapted to be worn in conjunction with a pair of spectacles which, alone, serve only to correct optical defects.

17. A hearing aid substantially as described with reference to and as illustrated by the accompanying drawing.

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757,788 COMPLETE SPECIFICATION
1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

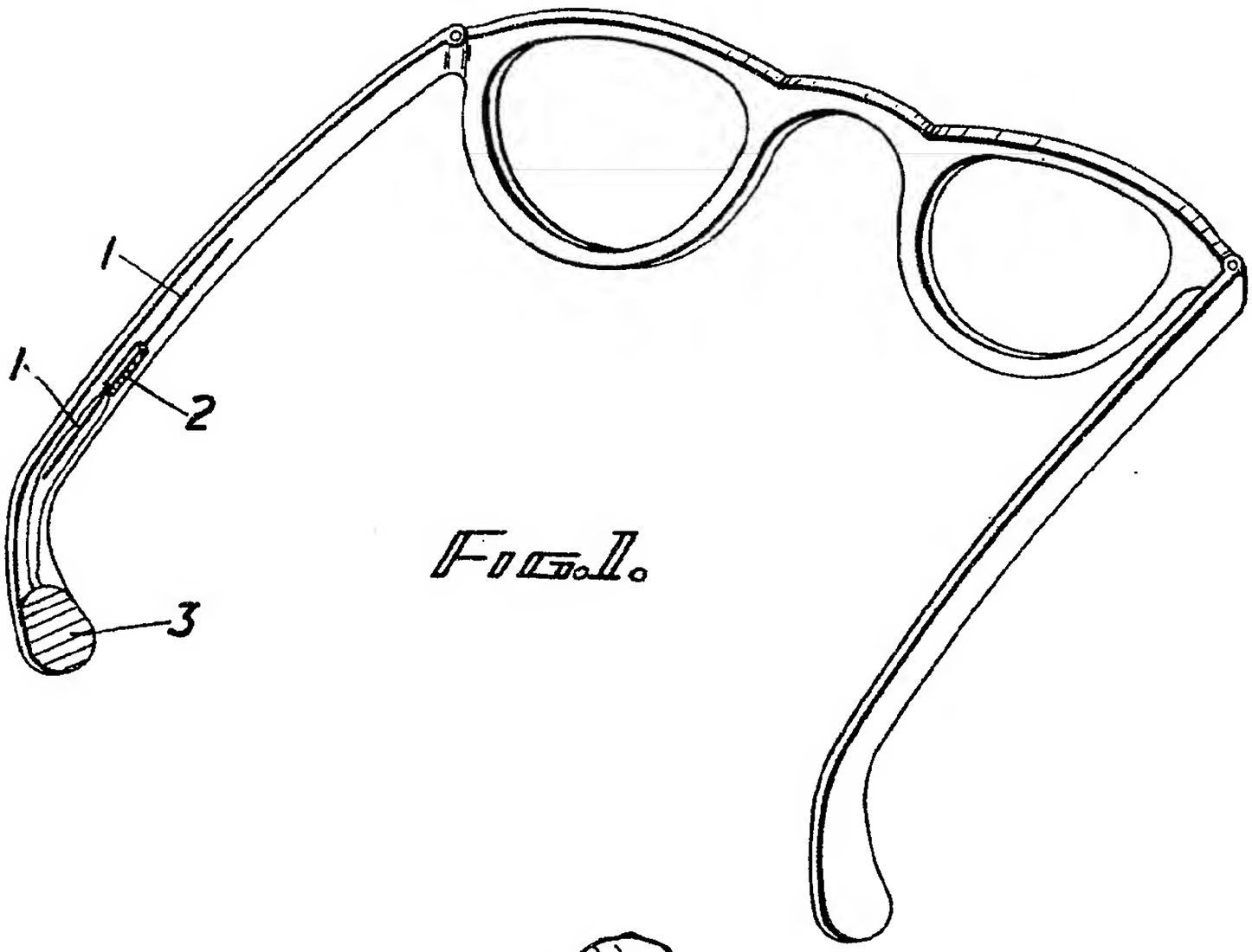

FIG. 1.

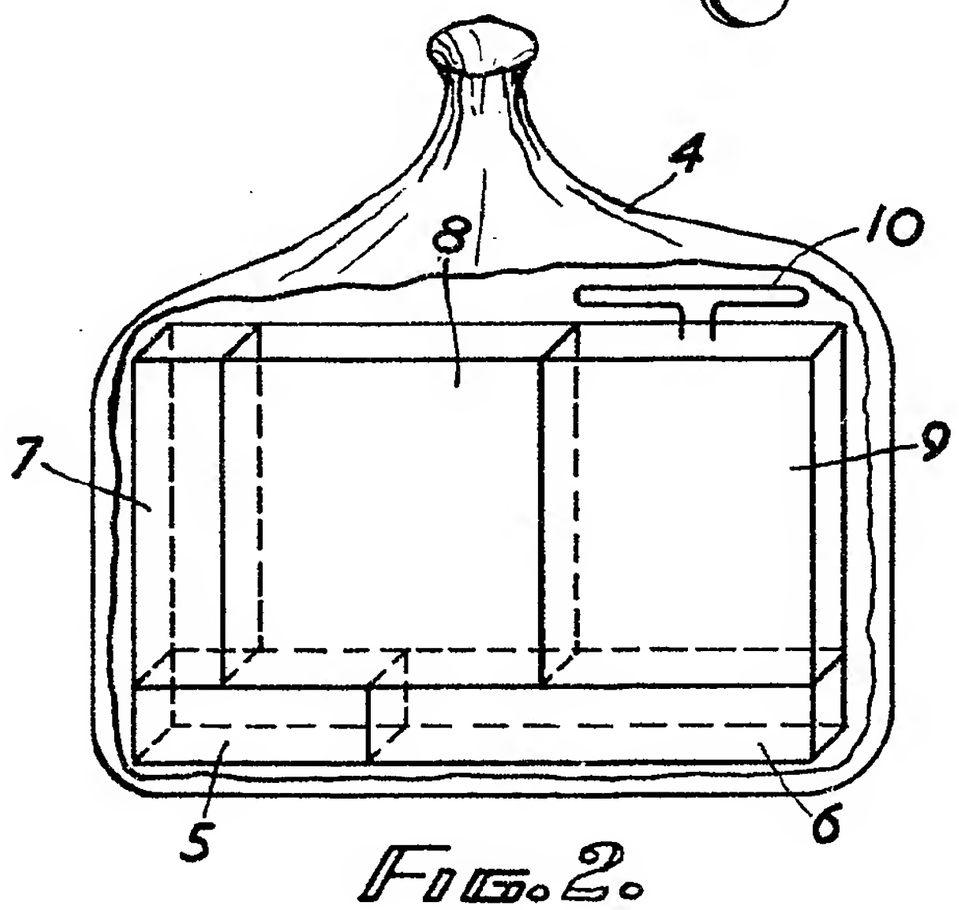

FIG. 2.